1970
AUGUST
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VOL. 24
8

RADIO ZS

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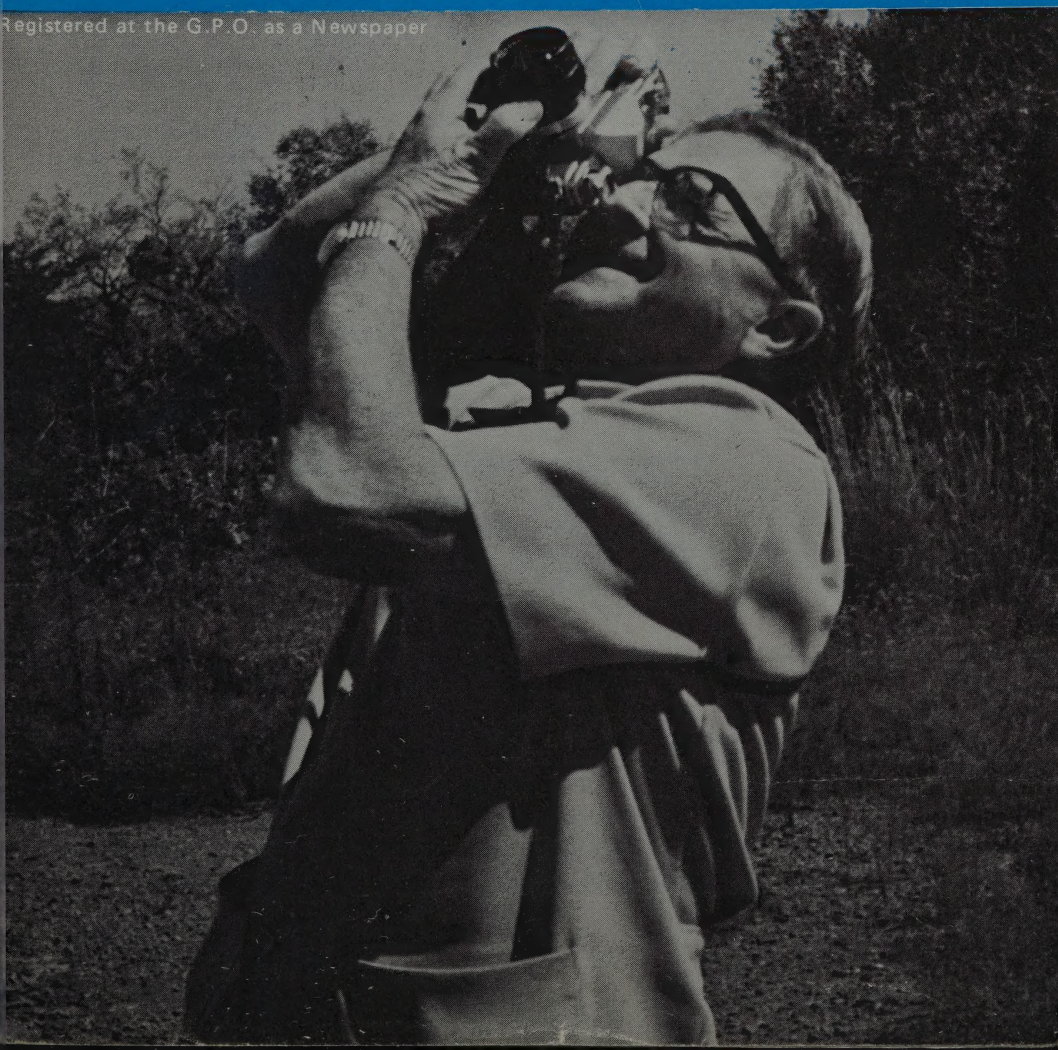

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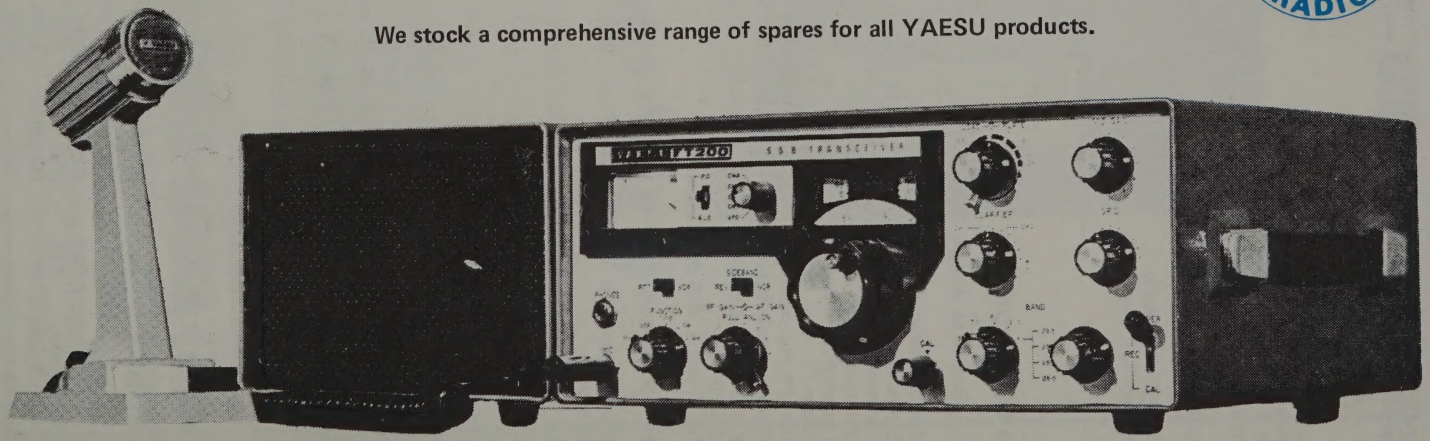

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Cover/Voorblad:
A candid shot of our President, who is a keen and ardent photographer — taken by ZS1IM at Kroonstad.

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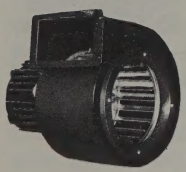

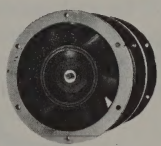

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80 METER TRANSCEIVER

By ZS6AJM Dick Chaplin

with acknowledgements to WATTS.

As mentioned in his article, OM Dick has based this Rig on a construction project in QST. It is well known that invariably when construction is attempted, one finds numerous components which cannot be obtained locally. He has therefore adapted the circuit and construction for local conditions and could quite easily be duplicated by the more serious minded constructer.

Editor.

This little rig was constructed by the writer with an eye for use in the TOTAL Rally, and has given a very good account of itself, as many who have heard it will testify. It follows a QST article (W5TAB, QST June, 1967), to which the reader is referred for full details of the operation of the circuit but, since the unit constructed in accordance with the published design gave some trouble in certain aspects, a number of modifications to the original have been effected and, in response to several requests, the complete design as modified is presented here.

Comparison with the original article will show that the sideband generation department has been completely changed. Due, no doubt, to the sluggishness of the war-surplus crystals which were all that this writer had available, the high impedance modulator used by W5TAB proved unsatisfactory due to "pulling" of the carrier oscillator as the carrier balance control was shifted – what appeared to be a very satisfactory "nul" turned out every time to be just the oscillator dropping out, and no substitution of crystals or experimentation with circuit values effected any significant improvements. In desperation, this section of the equipment was stripped and rebuilt to incorporate, with the help of the RSGB Circuits Manual, the low impedance design given here.

The carrier oscillator is now isolated from the balanced modulator by a phase invertor to the 150V regulated rail instead of to the 250V "raw" supply which powered the oscillator in the original provided a more smoothly operating carrier balance control.

A further aspect is that there should, in a low impedance circuit, be less susceptibility to carrier leakage through stray coupling than in the high impedance cases. An incidental consequence of the modification is that one section of an ECC83 becomes available for other use and the intention was to put this to work in providing audio–derived AGC. However, natural indolence and the discovery that in practice the absence of AGC is not as much of a bind as was first feared, have so far militated against this.

The sharp-eyed will also observe the addition of a 20pf capacitor at the commencement of the shielded lead from T1 Y2 to the IF amplifier – it was found in the original model that the capacitance of the shielded lead rendered it impossible to resonate the secondary of T1, so the first low-value silver-mica capacitor that came to hand in the junk-box (it turned out to be a 20pf), was wired in, and proved to cure the trouble.

W5TAB did not neutralise his PA. How he got away with this, heaven only knows, but the first check of the completed equipment in this writer's case vindicated his forboding that he, at any rate, was NOT going to get away with it! Accordingly, the PA circuitry was ☛

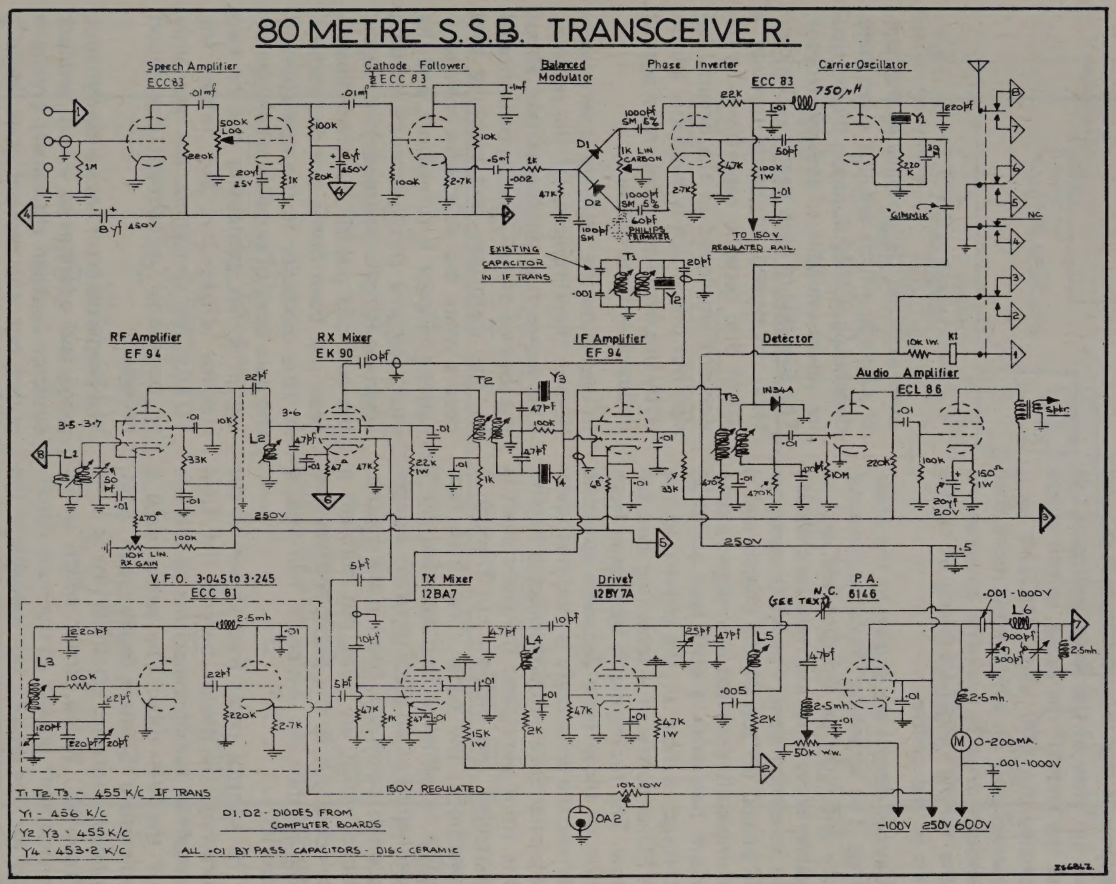
modified to incorporate the well-known bridge neutralisation circuit. Note carefully that the neutralising capacitor — a single-plate Philips trimmer — is as a safety measure returned to the cold (to DC) side of the .001mf tank coupling capacitor, rather than to the PA Anode, as is usually the case. The original design placed the carrier oscillator crystal Y1 on the same frequency as Y2 and Y3. It was felt that shifting the carrier frequency a little way down the high-frequency side of the IF curve instead of smack on it might improve the carrier and unwanted sideband suppression, so a crystal at 456kHz which happened to be on hand was tried — with satisfactory results and acceptable voice quality. Whilst on the subject of filters, let it be said that W5TAB indicates that the filter here may be set up by feeding an audio note to the rig and adjusting the IF transformer trimmers until the output waveform looks right on the scope.

The writer makes bold to say that it is virtually impossible to obtain the optimum setting by the method stated. The only way is to swing a BC221 back and forth across the filter bandpass whilst observing the IF amplifier voltage output through a VTVM and RF probe, adjusting the trimmers carefully until something approaching a symmetrical characteristic is obtained. Not too much can be expected in this respect from the single circuitry and crummy crystals used, but even though in the writer's case the best characteristic that could be obtained remains pretty lop-sided and bumpy, the voice quality is not too bad. Here a note on crystals is in order: Authors of articles on equipment using surplus crystals tend to recommend airily that "three or four crystals at each frequency be acquired, and the best ones selected". This may be all very well for those of us who are able to get their crystals for niks, but for those who, like the writer, are not in this happy position, experience suggests that good, current production crystals might more advantageously be bought in the first place from advertisers in QST or "Radio Communications". Probably crystals from British manufacturers would run a little cheaper under present conditions.

Reactive balance of the modulator is provided by a 60pf Philips trimmer. If adjustment of the trimmer has no effect on the nul, connect it to the other side of the carrier balance control. Depending on the strays present in each case, it may be necessary to add capacitance in parallel with the trimmer. Don't, incidentally, be tempted, as the writer was, in view of the tight space considerations in this corner of the chassis, to use a high capacitance transistor-type electrolytic coupling capacitor instead of the .5mf capacitor specified to couple the cathode follower to the modulator. A puzzling brief flash of carrier upon switching the transmit mode was traced to this departure — the capacitor was taking too long to charge and was upsetting the balance adjustment in the process. A scuffle in the junk-box eventually produced a .5mf paper capacitor of low voltage and consequently reasonable proportions — otherwise five .1mf small disc ceramics would doubtless provide a satisfactory answer.

No coil-winding data are given here since the writer used a heterogeneous collection of coil formers gathered from the junk-box. Construction of this equipment would not be attempted by anyone not having access to the necessary test equipment and a GDO is, of course, essential. The adjustment of the final amplifier grid tuned circuit is a little tricky, since the capacitance swing must be arranged to render it impossible at any point in the transmitter tuning range inadvertently to resonate the circuit at the VFO fundamental instead of the sum frequency 455 kHz further up. The VFO coil former should

QSY Page 8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ECC83
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750 µH
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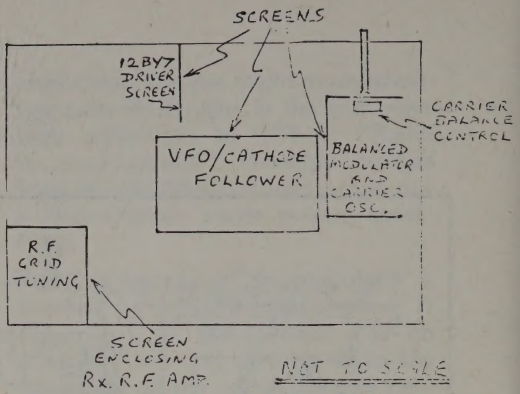
ECC 81
TX Mixer
12BA7
Driver
12BY7A
P.A.
6146
SEE TABLE
N.C.
250V
150V REGULATED
T1 T2 T3 - 455 K/C IF TRANS
Y1 - 456 K/C
Y2 Y3 - 455 K/C
Y4 - 453·2 K/C
D1, D2 - DIODES FROM COMPUTER BOARDS
ALL ·01 BY PASS CAPACITORS - DISC CERAMIC
0A2
0-200MA.
-100V
250V
600V

be a good quality item – ceramic, not "mud", with a good iron dust, not ferrite, core. The tuning range is a matter of choice. from the QST, the article which specified a 300 kHz swing, it appeared that drive difficulties showed up (in view of the fixed tuning of L4) at the ends of the range, so this writer settled for 200 kHz (215 kHz as it turned out) on which basis more than enough drive is available anywhere in the tuning range, L4 being of course set in the centre.

Layout details are shown in the drawings. The screening indicated is necessary and must be incorporated, and all valves except the final must be enclosed in screening cans. The VFO capacitor is placed on top of the chassis and is completely enclosed in a rugged aluminium box with a stiff lead araldited through a hole in the chassis to the VFO circuitry in a screening box below. The tuning dial is fabricated from one of those little Japanese epicyclic drives; the drive body is mounted upon a substantial aluminium bracket behind the front panel and the front shaft is extended and brought out through a bearing in the panel. The drive face plate is removed and replaced by a semi-circle of tin-plate to which a paper scale is cemented, bearing the calibrations which are read out through a window cut in the panel and covered by perspex in which a hair-line is scored.

The control relay (not shown in the drawing) is placed behind the final amplifier tuning capacitors to the left of the VR tube. The writer used a miniature Siemens relay with gold-plated contacts, obtained for a song from Mr. Kuisis, from which genial gentleman* almost all the parts required for this project, not available in the junk-box, were obtained. The transmitter mixer is a 6CS6 in the original design, but this seems unobtainable here and Mr. Kuisis happened to have 12BA7's in stock, so this valve was used instead. This necessitated the use of



some external "R" to balance the heater circuits, which are not given here, depending as they do upon the particular valves available to the constructor. The live side of each heater is, incidentally, by-passed to earth through a .01mf disc ceramic capacitor – a device not employed in the original design but one which is invariably adopted by this writer as a precaution against undesirable stray coupling.

In operation the little rig is very lively despite the simplicity of the receiver. The writer had doubts at first about the absence of AGC (being conditioned by the distortion and blocking that occurs when the AGC of a communications receiver is turned off, and the unsatisfactory performance ensuing when the RF gain is turned down below the overload point), but these doubts have not been borne out in practice. A little dexterity in the operation of the gain control is called when operating in a net containing one or two stations close by, but under the TOTAL net conditions last year only an occasional adjustment was found necessary.

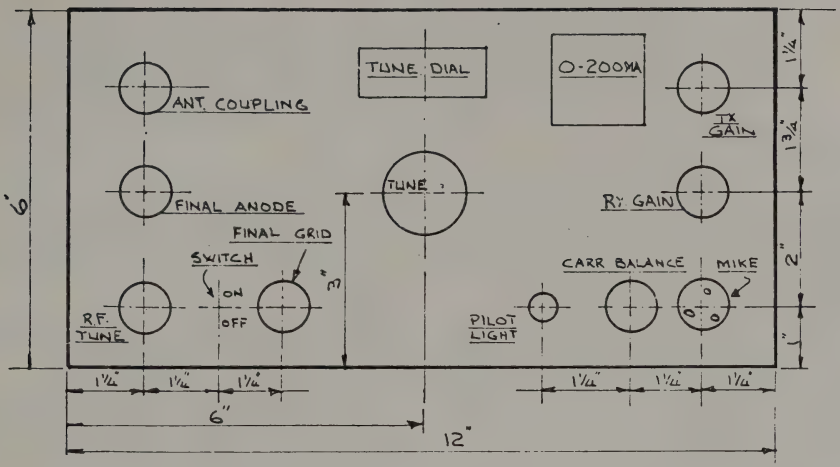
The simple detector has a wide dynamic range and operates as a true product detector – when the carrier crystal is pulled out, the receiver goes "dead", and the gain has to be cranked wide open before anything further can be heard.

Footnote :

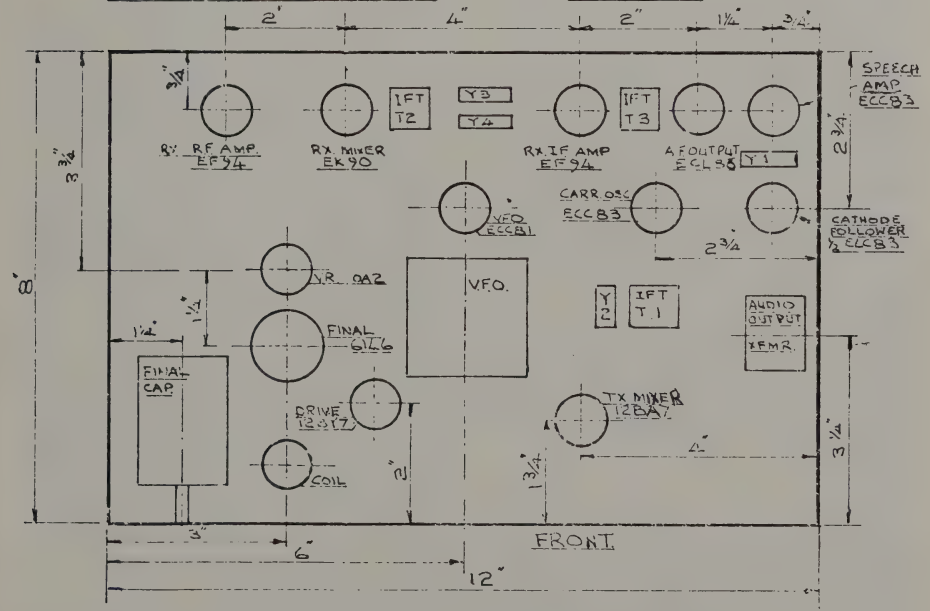
* Except on Saturday mornings.

80METRE SSB. TRANSCEIVER.

FRONT PANEL.



80 METRE SSB TRANSCEIVER. PLAN VIEW.



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THE "RHODESIAN" MOBILE ANTENNA

by H. L. Booth, ZE6JP

THE BIGGEST ADVANCE in Ham Mobile Antennae since Ham Mobile antennae were invented.

LITTLE INITIAL TUNING and no adjustment required when changing bands, just reload your TX on any band, 40, 20, 15 or 10 metres. A pi tank was originally used.

EXTRA 80 METRE BAND. THE FULL BAND WIDTH IS AVAILABLE. With only one operation it takes less than one second to change to 80m and back to 40m to 10m.

NO FANCY MATCHING UNITS. It is connected end on to your coax.

VERY STRONG ALMOST UNBREAKABLE. It breaks the branches it hits, they don't break or bend it. Little displacement, even at 100 m.p.h. it does not fold over.

PERFORMANCE EXCEPTIONAL. Contacts on 80m. Well over 1,000 miles early dawn, ZE to ZS1 using 40w input a.m., 300 miles very consistently.

Contacts on 40m. Daylight. Normal working over 1,000 miles. Mobile to more than 700 miles using AM 40w input and both mobiles using the same type antenna.

Contacts on 20. ZE to W6, A.M. 40 watts input — ZE to WC.W. 45w input, over long path. Also VE, VU, I1 etc.

Contacts on 15 metres. ZE to JA, CW 45w input.

Contacts on 10m. ZE to G. 40w input a.m.

All contacts whilst in motion, operating and driving, at the same time.

PRINCIPLE:— BASICALLY A HELIWHIP ON A FIBRE GLASS ROD.

OBJECT:— To improve radiation resistance by causing the voltage and current distribution along the length of the antenna to be as near normal as possible.

BASIC FORMULA FOR SINGLE BAND HELIWHIP. 3-100 MHz

This was evolved by experimentation and at best is only an approximation, as shape, rod length and wire gauge affect the formula.

However, to find the approximate length of wire used for a helical whip on one frequency only:—

Use $\frac{840}{FMHz}$ = length in feet.

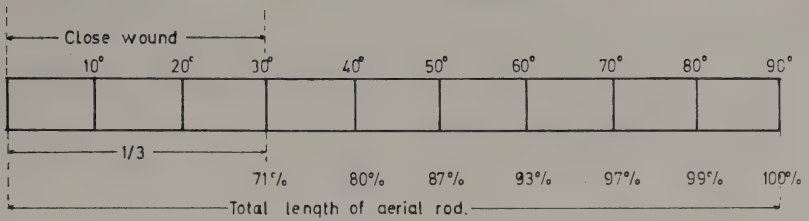
This will give a little more than is required, providing the top third of the rod is close wound. If less than one third is close wound, more wire will be required.

If more than a third is close wound, less will be required. It is the opinion of ZE6JP that the performance will deteriorate if more than a third of the winding is close wound.

WINDING DISTRIBUTION.

The length of the rod represents a quarter wave length antenna, or 90 electrical degrees. Divide the length of the rod into nine sections. Each section representing 10 electrical degrees. (The antenna being in effect a $\frac{1}{4}$/wave vertical, using the car body to ground capacity as an earth).

To find the percentage of turns which will be required at each 10 degrees



along the rod, use this form table, ignoring 10 and 20 degree percentage turns. *See Fig. 1.*

GAUGE OF WIRE.

E.g. Take one third of the length of the rod. From the form table identify that the percentage is 71 per cent of the total turns or length of wire (when using a parallel rod) which must occupy that space. From basic geometry, the circumference of the rod is 3.14 times its diameter. Therefore, dividing 71 per cent of the length of wire by the circumference will give approximately the number of turns to be close wound. Dividing this number of turns by a third of the rod length in inches will give the number of turns per inch to be close wound. From copper wire tables in the Handbook, find a suitable gauge of enamelled wire.

It is not advisable to use smaller than 0.028. If the calculation gives a size smaller than this, it is advisable to use a bigger rod and recalculate.

It is of passing interest to know that using this formula, a rod 18 inches long 3/16 inches in diameter was wound for 10 metres. It was mounted on the mobile and tuned. An input of 22 watts to this antenna was used and reports of R5 S8 were read from an N.C.300 RX at 10 miles across town but after one minute of operation, the antenna was too hot to touch as the wire gauge was too small.

However, the antenna would have been suitable for QRP Walkie Talkies or Model Control when specially tuned for this purpose.

WINDING PROCEDURE.

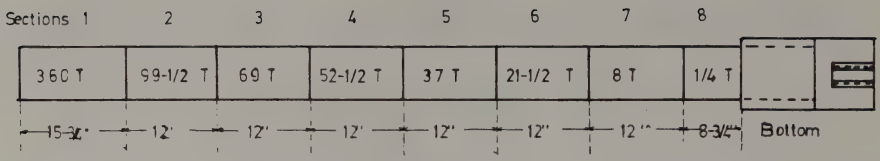
From the form table, mark off the rod into 9 sections. It will be easy to work out how many turns in each section as the rod circumference will be known, also the total length of wire, divide the circumference into the length thus obtaining the total number of turns. The form table tells the percentage of turns in each ten degrees. Divide each section into inches. It will be apparent that a change of turns per inch exists section to section. Mark each number of turns in each progressive inch to gradually accommodate the change of turns per inch. The winding then attains a constant change of pitch, and no sudden change of pitch is obvious. Indelibly mark the position of each turn. Anchor one end of the wire to some suitable point. Bind the other end to the "loose wound" end of the fibre glass rod, and wind on. Have in your pocket some plastic tape to lock the winding when your fingers get tired, or if you are interrupted.

Having completed the winding, lock the top end with tape and then adjust the turns to smooth out any unevenness in the winding. Lock the winding by covering well with Epoxy Resin. *See sketch for bottom termination.*

TUNING.

Mount the aerial in its operational position on the "Mobile". Ensure doors, boot and bonnet are in a travelling position. Ensure the car is in an open space of at least 20' around it. Use a single turn loop to earth the

☛



bottom of the aerial. *Use no long wires on the earth side of the loop.* By lying on the ground with nothing touching the vehicle, apply a G.D.O. to the single turn link. Check the G.D.O. frequency on an accurately calibrated receiver. The frequency should initially be lower than that required. Remove turns from the close wound end (i.e. the top) turn by turn until the dip on the G.D.O. is at the low end of the band. (e.g. 40 metre band around 7015 to 7020). It will be found that the aerial will load over the band by adjustment of the TX pi tank circuit).

Check to see that when a turn is removed that the end lies snug on the winding, and especially not sticking up.

NOTE: It serves little purpose to resonate the antenna on one frequency in the band. If this is done it may be found that if it has been resonated well up the band, it may not load at the lower end of the band.

One can pull the antenna by a pi section only a little way L. F., but quite a long way H.F.

Having detailed the basic helical whip, NOW:—

THE RHODESIAN MULTI BAND HELIWHIP.

This is an extension of the previous design, but by its size and shape, will operate satisfactorily on the 40, 20, 15 and 10 metre bands.

This antenna behaves like an H.F. choke. As the frequency is increased a series of resonances occur at different frequencies. These are governed by the shape, inductance and distributed capacity.

The successive low impedance feed conditions at resonance, are not normally harmonically related. However, this antenna does have this property. The resonances are sufficiently close to the ham bands, when not occurring in the band, for the antenna to be loaded by the conventional mobile Pi

	0"	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	12"
Section 2	9-1/2	9	9	9	8-1/2	8-1/2	8-1/2	8	7-1/2	7-1/2	7-1/2	7	
Section 3	7	6-1/2	6	6	6	6	5-1/2	5-1/2	5-1/2	5	5	5	
Section 4	5	5	5	4-1/2	4-1/2	4-1/2	4-1/2	4	4	4	4	3-1/2	
Section 5	7		7		6-1/2		6		5-1/2		5		
Section 6	4-1/2		4-1/2		4		3-1/2		3		2		
Section 7	2		2		1-1/2		1		3/4		1/2		
Section 8	1/4												

section tank circuit.

In addition to this, the adding of approximately 60 uH in series at the base of the antenna, adds the *whole* of the 80 metre band.

A similar performance can be expected on the 160 metre band with suitable inductance added at the base.

From band to band the feed impedance at resonance varies but is generally between 15 and 30 ohms. No difficulty is experienced when feeding with RG8U about 15 feet long. Forget S.W.R. so long as it can be loaded. Improving S.W.R. in this case adds very little to radiation.

CONSTRUCTION AND WINDING DETAILS.

The rod is of fibre glass with a nominal diameter of $\frac{3}{4}$ of an inch and from 8 foot to 8 foot 3 inches long. Slight variations in diameter due to ovality of cross section are not too important.

MARKING OFF.

Lay the rod along a suitable bench or table. Mark off as detailed below the turn positions along the rod. Scratch them in so that they will not rub off when winding. Mark off from the end to be the top at points as in *Fig 2. Fig 3 is the winding chart for sections 2-8.*

Having completed the marking off, wind on as previously instructed in the preceding heliwhip winding instructions and terminate in the same way.

Use only 0.040 enamelled wire.

A suggested antenna mounting is given in *Sketch 3.*

TUNING.

All previous instructions apply except as follows:—

The top of the antenna has turns removed until it resonates in the low end of the 40 metre band, around 7010-7020 KHZ.

Having reached this stage, proceed to load on 40, 20, 15 and 10. If, for example, it is found that it will load on all bands except the top end of the 15 metre band, remove one turn at a time until the band can be fully covered to the normal loading point.

It should be noted that after each adjustment of the antenna a check over the full band on each band should be made.

It is possible that a compromise might have to be made in some cases but in 3 separate antenna made, this was not found to be so.

It is very important that the antenna be in its normal operating position. Changing from mobile to mobile may require some re-adjustment.

80M. When adding the 80 metre coil, adjust to resonance, as before close to 3.5 MHZ. Again check the loading across the whole band, it will do it if your pi tank is not too restricted. Similar results should be achieved over the 160 M band.

VHF ENTHUSIASTICS NOTE.

Resonance at 50 and 70 MCS have been noted in addition but no attempts have been made to use them.

Boy, it is nice to change bands inside the mobile simply by reloading or by switching a relay to remove the short across the 80 M coil:— PARTICULARLY ON A COLD WET NIGHT!

—Harry

Modified by Colin, ZSICA. A.H.v.d.M.

MONTHLY IONOSPHERIC PREDICTIONS

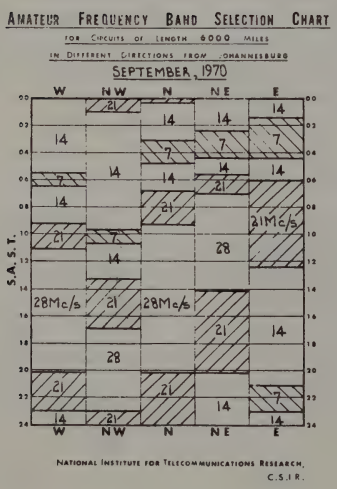
Extract of letter received from the National Institute for Telecommunications Research of the South African Council for Scientific & Industrial Research.

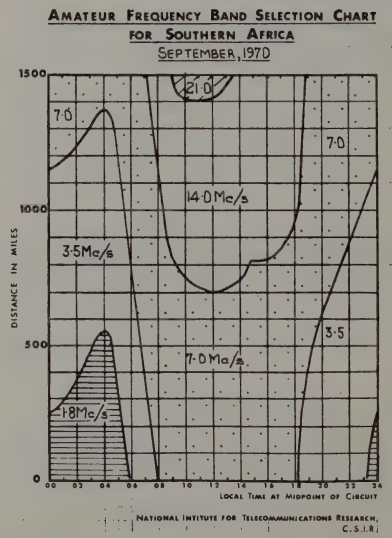
"We have altered the 6000 mile circuits as we suggested in our letter of 8th June, 1970. There has unfortunately been insufficient time to alter the format, so although the heading reads 6000 miles, the directions and distances are as follows:

West	Johannesburg	to	Sao Paulo	4617 miles (7429 km.)
North-west	Johannesburg	to	Chicago	8694 miles (13991 km.)
North	Johannesburg	to	Prague	5337 miles (8588 km.)
North-east	Johannesburg	to	Tokyo	8417 miles (13546 km.)
East	Johannesburg	to	Adelaide	6241 miles (10043 km.)

We intend also as soon as possible, to give the distances in kilometres. We shall do this as soon as we have been able to prepare a new master-copy and block."

FREQUENCY PREDICTION CHARTS





SOME LINEAR CONSIDERATIONS

by Henry Randall ZS5HF

PART II

Mention was made of the fact that most rectifiers used in supplies for linears are of the bridge configuration and here is a point of interest. The bridge circuit allows the use of diodes rated at only one half of the peak current that the supply must deliver. This of course is a theoretical situation and in practice one always allows some current carrying capacity in hand, but it does mean that if the supply has to deliver an Amp on peaks that one can very safely use diodes in bridge configuration of only 500mA – 750mA and this will certainly result in a worthwhile cost saving.

While on the subject of rectifiers, particularly Silicon as they are the best type for pulse service, it may be as well to mention that when connecting these rectifiers in series to obtain greater working voltage, it is essential that each rectifier be fitted with a parallel resistor of some 470k and a capacitor of 0.01uF. The purpose of these components is to ensure that an equal division of voltage occurs across each rectifier (the resistors see to this) and that transient spikes do not damage the rectifeirs – the capacitors act as a virtual short circuit to high amplitude short duration pulses. It is not necessary to fit the resistors if only one diode is used in each leg, but you cannot go far wrong by putting the capacitors in, in all cases. As you will be aware precautions of this type are not necessary in vacuum tube circuits. The determination of the rectifier PIV varies from circuit to circuit, but as a guide for half-wave rectifiers the PIV rating should be at least 2.8 times the RMS value of the AC. With full-wave rectification, the rating should be such that the rectifier can withstand at least 1.4 times half the secondary voltage and in bridge circuits each rectifier should be rated to at least 1.4 times the total secondary voltage of the power transformer.

It has been mentioned that power supplies for linears often use purely capacitive filters. This of course is quite in order but it must be remembered that the filter capacitor voltage can reach 1.4 times the total RMS of the secondary of the power supply if all load is removed. Caution should therefore be exercised when removing the tube from some circuits as the static tube current is sometimes used as the sole bleeder for the power supply. It is therefore quite possible that the voltage could rise beyond the rated value for the filter if the supply should be switched on with no tube in circuit or if the filament should fail. The moral is to provide some additional bleeder – even if it is at the expense of a few volts.

A large resevoir capacitor never provides 'good' regulation though it often is adequate. As far as linears are concerned, there are some circuits where this is acceptable and some where it is not. Plate circuit supplies will generally tolerate the type of regulation afforded owing to the relative insensitiveness of the plate circuit to voltage changes. Note the word relative. This does not mean a power

☛

supply with a voltage fluctuation of several hundred volts between full load and no load is satisfactory, but it does mean that regulation between some five and ten percent is probably quite good enough. The screen is far more sensitive to voltage changes than the plate and in principal purely capacitive filters should not be employed, but in practice this is often permissable because it is easy to provide a capacitor of sufficient value to produce the peak current as the peak current is very low compared to the plate. Adequate bleed circuits are also easy to arrange. Power supplies used for bias should under no circumstances use and rely on large value capacitors to provide the regulation which is absolutely paramount. I say under 'no circumstances' — possibly this is a little hard as there are certain classes of operation where purely capacitive 'regulation' would be adequate, but is does nevertheless make the point.

Heavy bleeder circuits, while wasteful of power do help to provide better regulation and if it is necessary to use purely capacitive filters then the bleeders should draw approximately one third of the two-tone test signal plate current when the amplifier is driven to maximum point.

It was mentioned earlier that silicon rectifiers are the ideal from the point of view of plate supplies. However, with screen and bias supplies it may often be acceptable to use other types of rectifiers, so one should not discard the idea of 'mixing' rectifiers within a unit.

The screen supply of a linear should be extremely well regulated. Such supplies rarely have to produce large amounts of current — generally an upper limit of some 25mA is adequate even at Stateside legal limits. The fact that the screen supply should be well regulated is conflicting with the protection of the circuit under fault conditions. If the supply is well regulated then it will also be capable of delivering a considerably higher currnet before the voltage will drop to a low value and the screen, as you know, will draw a very heavy current if the plate voltage should fail, and this excess dissipation generally results in almost immediate destruction of the tube.

An interesting method of protection is one which uses standard voltage regulator tubes. You will probably have noticed when studying tube parameters, that the screen voltage specified is quite often a multiple of ordinary regulator tubes voltages. For example a screen voltage of 810 could be achieved with four VR150 (600) and two VR105. If the limiting resistor is chosen so that the combination of the peak screen current and the quiescent current through the VR tube(s) is such that the voltage will drop below the firing voltage of the regulator tubes if the screen voltage exceeds the maximum permissable level, we have the perfect automatic screen protection because a low impedance, well stabilised supply is available under normal operating conditions and a high impedance poorly regulated circuit when the VR tubes extinguish.

Gaseous voltage regulators or zener diode regulators should be used in bias circuits as well. It is often advisable to utilize the bias supply in conjunction with a relay, so that if the bias voltage fails it is impossible for the HT supply to become opera-

tive.

From the point of view of tube selection, it must be remembered that large pulses of current must be delivered by the cathode and this invariably calls for a large cathode area with a relatively heavy heater demand as well. There are of course many tubes which have been specially designed for linear service, but as a rule these special tubes are expensive and are not readily available to the average 'Ham', but fortunately there is a breed of tubes which lend themselves very well to linear service — these tubes are TV line deflection tubes.

Unfortunately, the TV deflection tube was designed for LF application and so there is some limitation as to its satisfactory application at the HF end of the HF spectrum, though when consideration is given to the fact that line deflection is a some 15Kc/s, the performance of these tubes at HF is not at all bad. The limitations are of course due to the internal electrode capacities which, unless careful layout is employed, prevent satisfactory operation on 10 meters, and this limitation is particularly apparent because in order to get some worthwhile output, it is necessary to parallel several tubes which naturally aggravates the internal capacity problem.

Having considered a few basic design parameters, some thought as to how the amplifier may be driven will probably be worthwhile, because all points covered so far are common to all types of linear amplifier.

Grounded grid linears are most probably the most common, though some designers advocate normal grid drive. The latter one has one great advantage and that is the power required to drive the amplifier to peak is very low compared to grounded grid configurations. In a well designed circuit, 5 watts of drive could comfortably drive half a kilowatt while a grounded grid circuit would probably require more like 50 watts. This large drive requirement does not really matter because nearly all commercial exciters run at least 75 watts PEP. Just as the driven grid has an advantage so does the grounded grid, and in this case its inherent advantage is that the circuit is degenerative and is therefore basically a very stable arrangement.

Basically, the grid driven circuit is very similar to normal circuits used for drivers and multipliers for CW applications — the only parameters that are changed are those of the tube (bias etc).

Grounded grid circuits can pose a few headaches from the feed point of view because it is necessary to lift the cathode or filament above RF ground but it is still necessary to maintain a low impedance DC ground. In cathode/heater (indirect) tubes are employed the problem is minimised because a standard RF choke capable of carrying the full cathode current can be used — the feed-point being between cathode and ground — i.e. across the choke. However, in high power applications tubes are generally of the directly heated variety and the current drawn by the heater circuit is high and the voltage actually applied to the filament is critical. Ordinary chokes are obviously of no value.

Bifilar-wound filament chokes using Ferrite as a core material to assist

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Fig 1

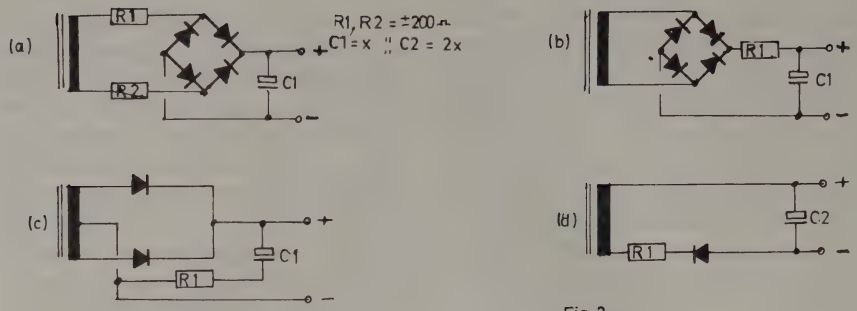
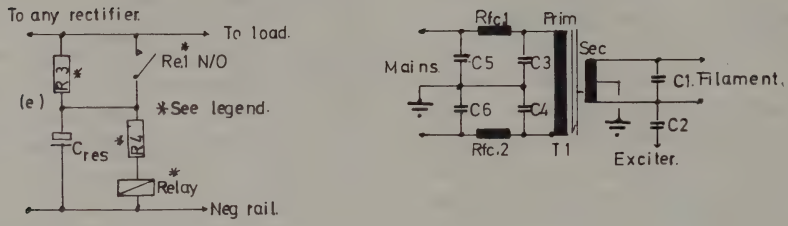


Fig 2.



LEGEND FOR FIGURE 1

Drawings (a) thru' (c) show the positioning of surge limiting resistors in the three most common rectifier configurations. It would be quite in order to place R1 in the negative lead of the circuit shown under (b) as has been done in the full wave circuit of (c). Similarly the resistor could be placed in the positive lead of the half wave circuit shown under (d).

Drawing (e) shows a more sophisticated method of protection. R3 is the surge limiting resistor and can be made a much larger value than the limiting resistors in the other circuits, and because of its higher value it offers far greater surge limiting action.

The necessity of R4 will depend upon the operating voltage of the relay. Miniature relays are available with coil resistance of 15K which operate between some 50 and 150 volts and draw quite low currents (about 10 mA).

The action of the circuit is that on the application of power, the resevoir capacitor will charge up via R3 until the voltage across the capacitor has reached 63 per cent of its maximum value — the actual time taken to do this will normally only be a few hundred Ms, but will of course depend upon the value of R and C — whereupon, by the proper selection of R4, the relay will operate and its associated contacts, which are normally open, will short R3 out and thereby apply the full voltage to the filter. Care must be taken when applying this circuit to high voltage supplies as many relays will not be able to withstand the full DC voltage which effectively appears across the contacts on initial switch-on. In high voltage circuits it would most probably be best to use the relay shown in the diagram as a donkey relay to switch a unit of more liberal ratings.

The drawing Fig. 2 shows a method of feeding grounded-grid linear amplifiers without the necessity for chokes to keep the filament above RF ground. RFC 1 and 2 can be conventional chokes or those wound on ferrite rods. The use of ferrite "beads" instead of rods would make an interesting experiment.

in achieving a high inductance with a small number of turns and thus to keep the DC resistance as low as possible have been used with considerable success. However, unless really heavy guage wire is used there will still be an appreciable voltage drop and also there is the possibility of heating. It should be remembered that a power tube can easily draw 10 Amps filament current and if a choke of 1 ohm DC resistance was used the voltage drop would be a volt and that such a drop constitutes a 20% loss which for most power tubes of the thoriated tungsten variety is far too much.

Apart from the problem of voltage drop there is also another problem which sometimes manifests itself when using cathode chokes. The problem takes the form oscillation. This may seem strange to say when only a few lines above it was pointed out that grounded grid amplifier is regenerative but it should be remembered that there is also a choke of very similar proportions from the point of view inductance value in the plate circuit and that by having two chokes, one of them in the cathode circuit, which is also the feed point regeneration can occur by virtue of the large amount of RF which can be picked up by such a device. Most RF chokes are relatively broad-band devices and careful layout can generally obviate any problems of this nature providing that the cathode choke is not self-resonant at the operating frequency. If the plate circuit choke was self resonant, it would burn out immediately.

to be concluded next month.

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WEST RAND BRANCH AWARD

This award is available to all amateurs who have had two way radio contact with the required number of branch members after 1 January 1970, on all phone or CW band with minimum reports of RS33 or RST338. (Mixed contacts not allowed).

(1) All ZS Amateurs and S.W.L.'s are required to submit QSL cards to prove communication with not less than 12 branch members plus 50c uncrossed postal order with all applications.

(2) All other amateurs are to submit a certified log extract (no QSL cards required) counter-signed by two licensed amateurs, to prove radio communication with 5 branch members, together with 8 RC's with all applications.

(3) All applications should be addressed to the Secretary, West Rand Branch, S.A.R.L., P.O. Box 562, Roodepoort, Transvaal, S.A.

TAK WESRAND TOEKENNING

Die toekenning word gemaak aan alle Radio Amateurs wat met die vereiste aantal lede van die tak twee-rigting radiokontakte bewerkstellig het vanaf 1 Januarie 1970. Kontakte op foon moet minimum rapport hê van LS33, en kontakte op gelyk golf, minimum rapport van LSN 338. (Gemengde kontakte word nie erken nie).

(1) Alle ZS-Amateurs en luisteraars moet QSL-kaarte, om kontakte te bevestig, met twaalf taklede asook 'n 50c posorder, met alle aansoeke aanstuur.

(2) Alle ander amateurs moet 'n gesertifiseerde loguittreksel (geen QSL-kaarte is nodig) onderteken deur twee gelisensieerde amateurs, om kontakte te bevestig met 5 taklede asook 6 I.A. koepons met alle aansoeke aanstuur.

(3) Alle aansoeke moet aan die Sekretaris, Tak West-Rand S.A.R.L. Posbus 562, Roodepoort, Tvl., gestuur word.

AMENDMENTS TO CALLBOOK NO. 22

*ZS1IR	K. D. Mitchell, 3 Ravensworth Road, Claremont, C.P.
*ZS1XX	G. T. Fainsinger — rejoined as member.
*ZS2EY	Eric W. Voogt, 20 Maple Avenue, Buffalo Township, East London.
*ZS2NN	Errol N. Mack, 12 Circle Road, Amalinda, East London.
*ZS3HF	H. H. Fischer, P.O. Box 6009, Windhoek.
*ZS5BO	J. P. Uys, 119 Victoria Street, Richmond, Natal.
*ZS5CG	H. van Rees, 108 Epsom Downs, Ronald Road, Montclair, Durban.
*ZS5CP	P. C. Robertson, 68 Molweni Road, Everton, Natal.
*ZS5HT	S. W. van Wyk, Plettenbergstraat 1, Dan Pienaar, Bloemfontein.
*ZS5LO	M. J. L. Kruger, Posbus 4567, Durban.
ZS5PX	Tim W. Anderson — delete — see ZS6AHS.
*ZS5WB	Lee Laurie, 134 Starling Place, Fynnland, Durban.
*ZS5WU	F. W. Unstead, 46 Four Winds, P. O. Hillside, Bulawayo, Rhodesia.
*ZS6AE	A. A. T. Cooke, P.O. Box 61587, Marshalltown, Transvaal.
*ZS6AMZ	H. Metz, 87-6th Road, Kew, Johannesburg.
*ZS6BCN	C. F. Matthews, P. O. Box 2878, Pretoria.
*ZS6SJ	S. Giorgi, 1 Hunter Court, 142 Hunter Street, Bellvue East, Johannesburg.
*ZS6SP	Neil Swerdlow, 3 Alteryn Mansions, Corlett Drive, Illovo, Johannesburg.
*ZS6VM	L. J. Webb, 100 William Road, Norwood, Johannesburg.

THINGS HAVEN'T CHANGED MUCH OVER THE YEARS

by Max Adler, ZS1CD

Some twenty or so years ago the Golden City Radio Club was formed by O.M. Edgar, who, at the time, held the call ZS6B. In those days I had a little more time at my disposal than nowadays and was appointed Secretary of the Club. Recently while cleaning out some old papers I came across a copy of my "notice of meeting" and on reading it, the thought occurred that what was said then applies even now. It is my hope that readers will enjoy this re-print and understand the moral behind it. Here is the letter exactly as originally despatched.

GOLDEN CITY RADIO CLUB. Vol.1 – No. 7.
"The time has come, the Ground Plane said, to talk of many things; of Hams and Rigs and antennae, and Radio Club Meetings". (with apologies)

So hearken unto me, all ye OM's and YL's, whilst I unfold unto thee a story of an ideal – an ideal that blazed forth in a brilliance eclipsed only by that of the great sun-god RA at the hour of noon.

And it came to pass, some seven moons past, that Edgar, known as B, of the tribal area ZS6, did think to himself: What can I, a humble member of the tribe of HAM – worshippers of the mysterious god DX whose comings and goings no mere mortal dare predict – what can I do for our people ? How can I help them to better understanding of, and bring them closer to, the great DX..... And, after much meditation, did B summon to the tribal conclave, Ra-Gch-Ew, all adherents of DX. And some did heed the call and did venture forth from the safety of SHACK and, braving the terrible jungle of JHB, did hie themselves to the appointed place.

And there were present those whose birth-names were not spoken but who answered to secret names given them by the High Priest of PMG in whom was invested the sole authority to permit the clan to seek the mighty DX. And they answered to such titles as HO; OB; SO; KK; RB; ACD and many others. And to them did B expound the thoughts that burned within him and, having spoken, besought them to speak of their thoughts and they did with one voice answer – Hail to thee, O Edgar-known-as-B that in thy wisdom do propound these matters. Do thou then lead us and we will follow thy every wish! Whereon did B reply "The honour is great and the task difficult, but if this be your desire – so be it". But assistance was necessary in order to carry the word of B to the clan – and the gathering spake these words..... in this are we helpless for is not our day spent in the salt-mines keeping the wolves from our shacks and YL's – and our nights seeking DX; shall he who liveth a life of ease and spendeth his WHOLE day and night seeking DX, shall he not give of his day to do this small thing? And the one called ACD bowed his head in shame and said –So be it.....and it was so recorded that B be known as the Chair-Ham and ACD be known as the Sec-Ham. And it was further recorded that the assembly be known to all and sundry as GCRC and that on the day of TUES in the second week of every moon, the assembly would gather for revelry and Ra-Gch-Ew. And though this meant braving weather and the jungle JHB, all present

took oath that come hell or high water, not even the roaming tsotsi would hinder thier coming to Ra-Gch-Ew. And warning was given that the evil god QRM was banned from Ra-Gch-Ew and woe betide he who allowed QRM to enter the sacred portals of Ra-Gch-Ew. And all were agreed and did make haste to pay tithe; and after further talk of VFO and spurious radiation and 807, the assembly did disperse and, under cover of DARK did each return to his own shack and pursue the great DX, crying out "CQ CQ CQ DX": and some found him not. And those whose cry was in vain did not, as was their wont, beat their breasts nor tear their hair, nor did they curse the evil QRM for they were consoled by knowing that at Ra-Gch-Ew would they be advised of their errors and how best to seek DX. And goodwill and friendship radiated even as the glowing rays of the sun-god RA. And the tribe of HAM were content. Yea, and even those not of HAM, the ZSL who were blessed by SARL, father and mother of all ZS, yea, even they rejoiced and were welcomed at GCRC Ra-Gch-Ew.

And for four moons all was well; and in the fifth moon did an Elder of SARL, EU come to impart words of wisdom gained by many years of searching for DX. But, alas! the elements did rage that night and only seven seekers after knowledge did gather to pay tribute to EU — yet was EU content. Then did the propaganda priests of the land of W promise that they would send a priest with apparatus B-Ios-Cope to GCRC — and he came — and this being the last Ra-Gch-Ew before the festival of X-M-As, it was expected that all brethren would be present. But again did the brethren absent themselves and again did the leaders despair. And then did come the evil edict of the High Priest, PMG, which spelt doom for the ZSL — blessed of the SARL but not PMG — the edict which stated that henceforth did ZSL forfeit their right to speak and must confine themselves to listening only. And it was imperative that GC-RC make talk of this matter and urgent summons was sent to all brethren to attend Ra-Gch-Ew in the first moon of the year. But that most evil of all evils, A-Pa-Th-Y, had possessed the hearts of the brethren and lo! at Ra-Gch-Ew did come only the Chair-Ham, the Sec-Ham and one whose rights were so cruelly removed by PMG and was now known by his birth-name of Nicol. And these three, with heavy hearts, did talk until the early morning but did not know what to do. And it is with urgency that I, your Sec-Ham do appeal unto all brethren — Do not let this Ra-Gch-Ew die unto nothingness. Defy the evil gods of QRM and A-Pa-Th-Y — come to Ra-Gch-Ew on the stipulated day and hour of SAST 2000. Gather unto the fold all errant warriors of HAM whose shack is within reach — Instruct your YL's to prepare succulent dishes to tease the palates of all — and let us once again rejoice in the comradeship propounded by the Chair-Ham. Let us endeavour to be of assistance to all of the tribe of HAM that we may each and everyone be brought closer to the great DX, whose comings and goings no mere mortal may predict.

And so endeth this tale brought you by your Sec-Ham ACD as instructed by the Chair-Ham B, and closeth on the ancient benediction of HAM "73, good DX, and may the years to come bring much happiness and prosperity to all of the tribe of HAM".

(Note: by using a little imagination and substituting names and places, the writer has little doubt that many hams throughout the world will recognise the problem. The remedy? That, my dear readers, lies in your hands.)

INTRUDER WATCH – by Fred Laun, HS5ABD.

Acknowledgement to "OHM", Hongkong.

It does not take long for the amateur operating in Asia to discover that he and his fellow amateurs are not alone on their bands. The amateur bands are also inhabited by all sorts of weird signals produced by commercial and governmental facilities which are probably not supposed to be there.

Many of these signals are caused by harmonics or parasitics, but perhaps most of them are intentionally operating on these frequencies.

The Geneva Convention of 1959 provided for exclusive use for amateurs in Region 111 of 7000-7100, 14000-14350, 21000-21450 and 28000-29700 khz. However, the Soviet Union filed a specific amendment stating that it reserves the right to assign point-to-point CW and RTTY services in 14200-14350 khz. on a shared basis with amateurs.

It can be seen, then, that except for 80 meters and certain signals on a portion of 20 meters, everything of a commercial/governmental nature which is heard in amateur bands is violating the Geneva Agreement. Of course, if a particular country did not sign the Agreement, it cannot be bound by its strictures, and that explains to a certain extent what has happened to 40 meters. However, perhaps most of the signals heard emanate from signatory countries of the Geneva Agreement, and thus, if properly notified, these countries should remove the offending signals from the amateur bands.

One thing should be made clear. Due to the roundabout wording of the Geneva accords, it is necessary that interference to a particular station in the amateur service be mentioned in any complaint, and the call letters of that station should be given. In other words, it is technically not sufficient just to report a commercial station operating on a frequency reserved for amateurs, but interference with the amateur service must be shown as well.

The American Radio Relay League has set up an "Intruder Watch" to correlate reports by amateurs of interference by stations of this type. Complaints are then sent, through the U.S. FCC, to the administrations involved. If the problem involves a harmonic or parasitic, steps are usually taken to correct the problem immediately. If the offending station is intentionally operating in the amateur bands, however, the process usually requires frequent, repeated complaints until the offending administration gets so fed up with complaints that it finally moves the station out of exasperation.

Of course, many such stations are military stations using tactical callsigns which do not correspond to internationally assigned prefixes, and in these cases, the origin of the signal is difficult to pin down. Nevertheless, a careful description of the language or accent used, beam headings, etc., may be enough to identify the country of origin once the report reaches the experts who correlate this information.

Referring to military stations, and speaking as an American citizen, there is perhaps a special need to comment here on the myriad U.S. military stations operating in the Viet Nam war zone, which sometimes find their way into the amateur bands. There has been a tendency on the part of many amateurs to try to justify such operations, because, after all, "there's a war on." Well here is one vigorous dissent from this view. At any given time, many nations are at war; if this excuse

can be used by one, it can be used by all: the Israelis and the Jordanians, the Hondurans and the Salvadoreans; the Russians and the Chinese. And if this excuse is indeed used by all, what have you got except utter chaos? No, in peacetime or in wartime, either you have international regulations or you don't. Every nation and every radio service suffers when there is anarchy on the radio spectrum, and if a military unit wants its assigned channel respected by others, then it too must respect frequencies assigned to other services. There is only one reason for international frequency assignments, and that is to enable everyone everywhere to communicate more efficiently. If one particular radio service breaks the barriers, that service will probably suffer just as much as all the others from the chaos that results.

If you are interested in joining the "Intruder Watch" the "Intruder Watch" is interested in having you. This is especially true if you have gear capable of copying RTTY. Write to:

Intruder Watch, ARRL,
225 Main Street,
Newington,
Connecticut, 0611, USA.

for report forms and start reporting. A sample report form is shown in Figure 1.

Of course, Ken, exVS6AL, used a more direct, and phenomenally successful means of chasing intruders out of the bands, but for us pedestrians, the "Intruder Watch" is probably the easiest approach. *Go get 'em!*

INTERCEPT REPORT, ARRL INTRUDER WATCH

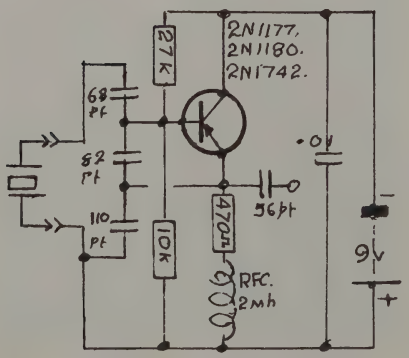
Date/ Time GMT	Freq.*	Mode	RS(T)	Language**	Call or Ident.	Remarks***

* Add E (estimated) or M (measured).
** Enter only if positive identification of language.
*** Indicate unusual signal characteristics, call sign of station being worked or called by intruder, any indication of location or direction of intruder, calls of amateur stations being interfered with, hours during which you were monitoring, and the bands of frequencies that were monitored.

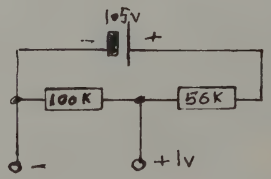
Your call _____ Name _____

Address _____

Transistor Xtal Checker.



VOLTER - For calibrating V.T.V.M.



STEREOPHONIC BROADCASTING

The stereophonic broadcasting of music using standard AM equipment has made its commercial debut, it was announced today by Kahn Research Laboratories, Inc., a company associated with ELECTROSPACE CORPORATION (American Stock Exchange).

According to Leonard R. Kahn, Kahn president, Radio Station XETRA, a 50,000 watt station in Tijuana, Mexico began broadcasting in AM stereo on May 2, 1970. Kahn Research Laboratories furnished the special AM stereo transmitting equipment.

"We are quite excited about this technique," Mr. Kahn commented, "because it permits the listener to enjoy stereo on conventional AM radio. All that is presently needed are two AM sets," Mr. Kahn continued, "one tuned a bit higher than normal, the other a bit lower. The result is true stereo performance."

Station XETRA, a 690 kc channel, is heard in Los Angeles and Southern California. AM stereo will cover about fifteen times the area of an FM stereo station having the same power. The method should provide substantial improvement in reception in automobiles by eliminating the breakup effect associated with FM stereo reception. This effect occurs in fringe areas and where the signal is blocked by tall buildings and natural obstructions.

Mr. Kahn stated that the patents have claims covering receivers as well as transmitters. The receivers would be similar to conventional radios and could be tuned to receive stereo with one setting as do present FM stereo radios. However, the AM stereo receivers would be less complex and have fewer and less expensive parts than present FM stereo receivers.

Mr. Kahn also pointed out that AM stereo broadcasts may be received monaurally on conventional AM radios without any distortion or reduction of sound quality.

Kahn Research Laboratories, which owns 21 U.S. patents, specializes in the development of communications and broadcasting equipment. Since its beginning in 1952, it has built equipment for over 1,700 radio stations throughout the world.

Electrospace Corporation of Westbury, Long Island, New York, manufactures telecommunications equipment in its U.S. and Puerto Rican plants, and its facilities are available to produce Kahn Research Corporation AM stereo transmission and receiving equipment.

C. Q. ALPHA FOXTROT.

As 1970 is the 50th Anniversary of the S.A.A.F. and the 30th Anniversary of the formation of the Radio Signal Company (founded by Radio Amateurs). Abe Goldberg ZE4JG, has suggested that all airforce personnel holding an amateur licence have a get together on the air during the weekend 8th and 9th August, 1970, in order to see how many old friends can be contacted. Starting at 0600 hours S.A.S.T. on Saturday and ending at 1800 hours S.A.S.T. on Sunday with a nett on 7050 Kilohertz at 1000 hours on Sunday. Other then the 7050 KHz nett, any band or mode may be used.

THIS IS NOT A CONTEST.

OBJECT: In order that ex S.A.A.F. and R.A.F. Amateurs and their Amateur friends have a get together.

No prizes and no awards. Just call C.Q.A.F. and enjoy a NATTER.

THE NET CONTROLLER TO BE ADVISED LATER.

STC(SA) TO HOLD COMPONENTS SYMPOSIA AT ELECTRA 1970

Standard Telephones and Cables (SA) Ltd will hold a Components Symposium at Electra 70, South Africa's showplace of the Electronic and Components Industry. The symposia which features International speakers will be presented from September 14th until September 19th, 1970 at Cafeteria Hall, Milner Park Show Ground.

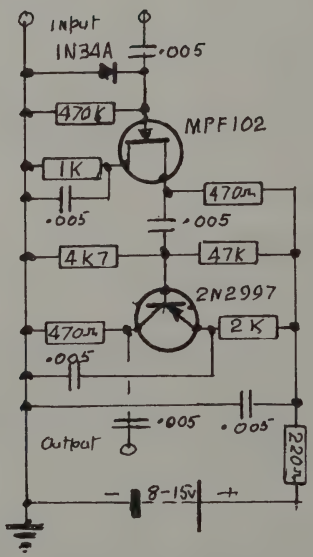
From ITT Components in Europe Noel Sheppard will especially fly to South Africa to present a paper on component development in the ITT system of companies. Applications Engineer Tim Willmot will deliver a talk on the design of circuitry using silicon devices with particular emphasis on low cost designs.

Components Marketing Manager Alan Teece will lead the symposium and conclude with a survey of new developments taking place both in South Africa and abroad.

Note to Editor: This series of Components Symposia is presented as a public service by STC(SA). Interested Technical Personnel wishing to attend the symposia on any of the days are requested to direct their applications to :

Components Symposia C1/1
P.O. Box 286
Boksburg.

Wide-band RF
Pre-amplifier.



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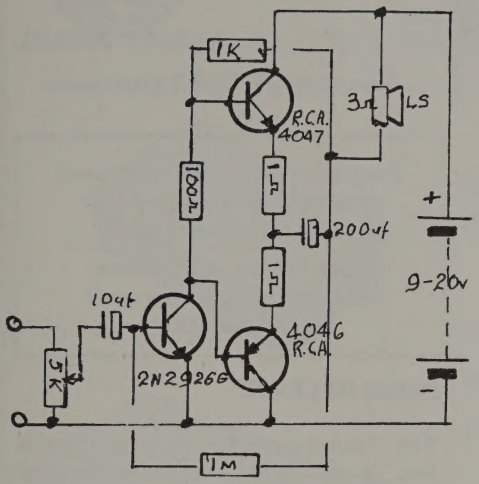
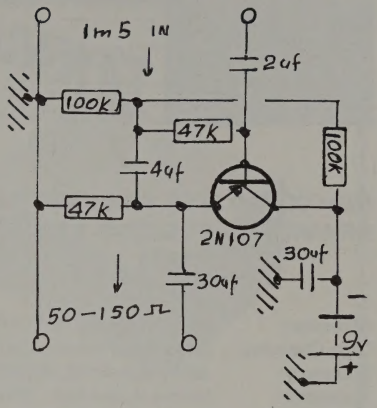


TRANSIMATCH.



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CSP 11

DISTORTION FREE
SPEECH PROCESSOR

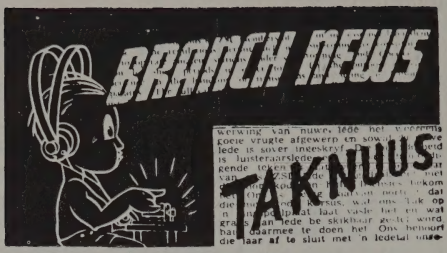
5½" wide - 3¼" high x 7½" deep

The Comdel CSP 11 is a communication aid designed for any system using a microphone for voice transmission. Its prominent feature is the achievement of peak limiting without the distortion which is the very undesirable by-product of conventional clippers. Therefore the average or talk-power gain obtained is more effective. In addition, the CSP 11 frequency response is tailored for maximum intelligibility of voice transmissions.

ex-Stock **R130.00** Ham nett.

HOLLANDS RADIO

Replaces a Linear. This speech processor will give you at least 1½S UNITS improvement. Ideal for the ham with a limited budget.



NEW COMMITTEE FOR EAST RAND BRANCH AS ELECTED 8TH JULY, 1970.

Chairman:	Mike Rowland, ZS6AFG
Vice-Chairman:	Duppie du Plessis, ZS6BDD
Secretary:	Jack Adendorff, ZS6-007
Treasurer:	Bernie Ackerman, ZS6ACK
C/Members:	Gert Roux, ZS6AYU
	Dave Muller (New Member)
	Horst Fischer, ZS6BEJ
	Jimmy Dishop, ZS6TQ

TAK NOORD-TRANSVAAL:

Op ons algemene jaar vergadering gehou te Pretoria-Wes op 20 Junie 1970, is die volgende verkies om op die nuwe komitee te dien.

Voorsitter:	Heins du Preez, ZS6NS
O/Voorsitter:	Tinus Large, ZS6TL
Sek/Tesourier:	Albert le Roux, ZS6AXL
Lede:	Gert Tryman, ZS6APM
	Braam de Beer, ZS6512
	Gert Terblanche, ZS6BIK
	Dibbie de Bruyn, ZS6-514

Die opkoms was nie na wense nie maar daar was darem 48 lede, LV's en Juniors teenwoordig.

Na die vergadering het die gewone geselligheid plaasgevind met koffie, tee en versnaperings wat baie vriendelik deur die LV's bedien is.

Die aand is toe afgesluit met 'n film vertoning.

Die komitee het vier dae later byeengekom en daar is baie groot dinge in die vooruitsig gestel vir die volgende jaar.

ALBERT ZS6AXL

Wanneer u Advertensies beantwoord maak melding daarvan dat u dit in Radio ZS gesien het.

When replying to Advertisers please mention that you saw it in Radio ZS.

PRESS RELEASE:

The Foundation for Amateur Radio Inc., a non-profit institution devoted to advancing the interests of amateur radio with its head-quarters in Washington, D.C., announces the establishment by it of a Hospitality Committee with the objective of providing visiting foreign licensed radio amateurs with an opportunity to meet some of our local active hams and if desired visit a local amateur station. Any visiting foreign ham can get in touch with the Hospitality Group by calling 893-8383. It will be appreciated if calls are made during the hours from 0800 to 2000 daily. Arrangements can be made to greet the foreign visitor and to give him an introduction to our Capitol City as well as to amateur radio US style.

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Obtainable from Headquarters

EDDYSTONE

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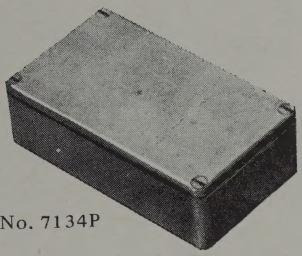

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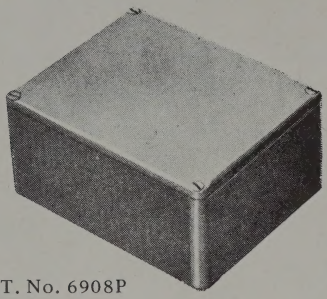

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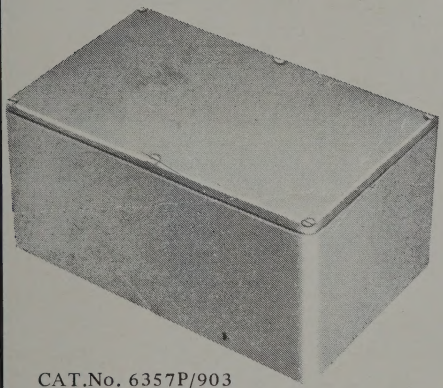

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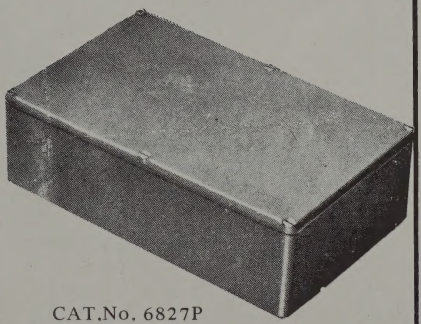

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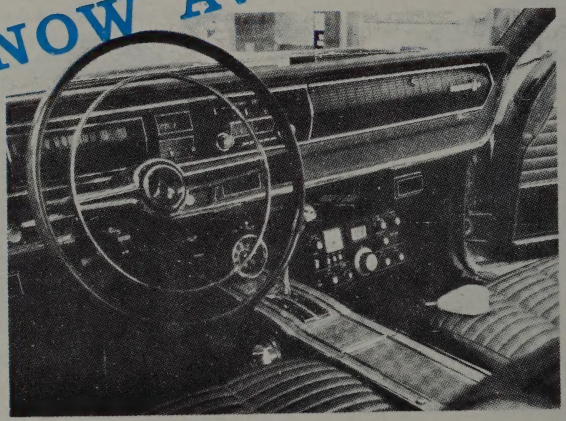

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PUBLISHED BY THE SOUTH AFRICAN RADIO LEAGUE, P. O. BOX 3911, CAPE TOWN
AND PRINTED BY TYPEX PRESS (PTY.) LTD., 201 BREE STREET, CAPE TOWN